THE COMBUSTION OF SMOKE, AND JUCKES' PATENT FURNACE.

As whatever relates to furnaces is of importance to the builder, we would draw the attention of our readers to the newly patented invention of Mr. John Juckes, which is designed for the important objects of economizing the fuel, and the entire suppression of smoke. The plan has been for some time before the notice of the public, having been introduced at the late meeting of the British Association, at Manchester, since which it has been exhibited and explained at successive meetings of the Royal Institution, the Society of Arts, Horticultural Society, and other learned bodies. The details of the plan are very simple, and as they are susceptible of being understood, without reference to drawings, whilst those who are interested in the subject have ample opportunities for inspecting the same in practical operation, we submit the following particulars to our readers.

We may observe, that the perfect chemical combustion of the coal is effected by the mechanical arrangement of the furnace. That the former is the case, is shewn in the *entire* absence of smoke from the chimneys of the furnaces in which it is employed, as it is entirely divested of the carbonaceous matters the diffusion of which is the source of so much injury to health and vegetation, as well as in the perfect form of the clinker, which is of a much more solid form than that from ordinary furnaces, and consists merely of the saline and earthy, or unvaporizable parts of the coal. To produce these results has occasioned much curious inquiry and scientific investigation; but they could by no means be produced more perfect than in the present case. The furnace consists of an endless chain of fire-bars, which pass in continual motion over two drums, the fuel being supplied in the front, and traversing with the bars, passing through the successive stages of combustion, until this is finally completed, and the whole of the volatile or vaporizable parts having been consumed, nothing but the scoria is ejected at the back. The interstices between the bars admit of a sufficient supply of air for the support of combustion in all its stages, and at the same time keep them perfectly free from clinker. The phenomenon of the common fire-grate or furnace, or the changes which take place in their combustion of fuel, are seen here; but whereas in the former case this is productive of great loss, all the particles are in this furnace made available for the support of combustion. When coals are supplied to a furnace in ordinary cases, they part with a large quantity of vaporizable matter given off by the first impression of heat which escapes up the chimney in the form of smoke, inflicting a nuisance upon the community, and to the injury of the manufacturer, as every particle of smoke is a part of the combustible portion of the coal which has escaped being burnt. In this case, however, as the fire bars traverse, the more volatile particles having been separated first, the less volatile next resolve themselves into their chemical combinations, each along with that in which the combustion is become more perfect, and as complete an analysis of the coal is effected as can be produced in the laboratory of the chemist. The rate at which the fire bars travel is about six feet per hour, being moved by a strap attached to a steam-engine, the power required being less than one-twentieth of a horse. The coals are introduced directly on the fire bars, passing into the furnace under a door, which lifts up instead of opening on hinges, thereby forming a gauge for the fuel, so that the fire is kept level from one end to the other, whilst, as the hopper may be made large enough to hold fuel for any length of time, the supply of the fire is rendered quite independent of the caprice or negligence of the stoker. Amongst other mechanical arrangements must be noticed, that the whole of the apparatus can be removed from under the boiler in case of need or repair, as it runs on rails, whilst the perpetual traversing motion of the bars, the short period which they are exposed to heat, and the general interposition of an active non-conductor upon them in the coal, ensures the prevention of oxidation and their consequent durability.

The economy arising from the use of this furnace has been proved to consist not only in the combustion of all the vaporizable particles of coal, a great deal of which is, under ordinary circumstances, given off in the form of smoke, but in the circumstance that the coal-dust, or small particles of coal, will in this arrangement burn equally well with the largest and best. This saving will of course in some measure depend upon the price of the fuel, and the local circumstances under which it is employed; but the report of Mr. Roberts, of the firm of Learmouth and Roberts, states it to be in their case 52 per cent. It may be remarked that the uniformity of heat which is insured causes the saving of the boiler, whilst it is of the first importance in many manufacturing processes. The furnace may, we understand, be inspected daily in operation at the engineering establishment of Messrs. Easton and Amos, Grove, Southwark; Mr. Palmer, Stearine candle manufacturer, Great Sutton-street, Clerkenwell: Messrs. Learmouth and Roberts, leather-dressers, Page's-lane, Orange-road, Bermondsey; and Mr. Atkinson, calenderer, Lamb's-passage, Chiswell-street.

DR. HENDERSON'S GEO-CHORIONS.

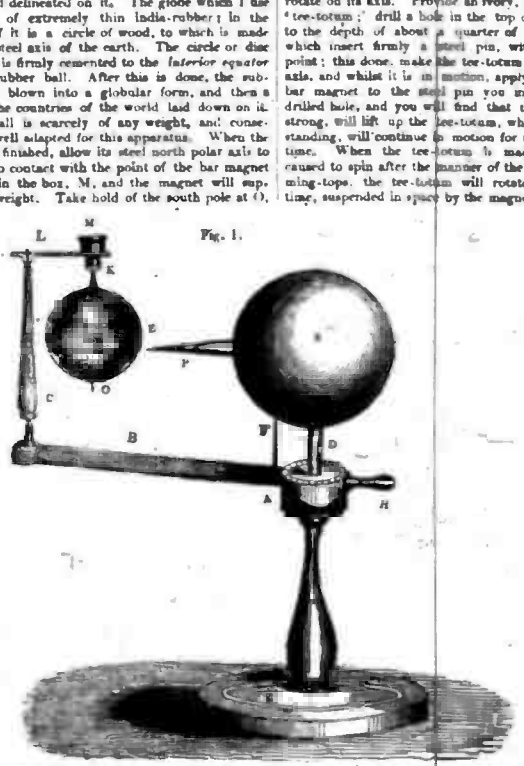
(*From the Mechanics' Magazine.*)

"Sir,—The accompanying sketches are perspective representations of two pieces of my astronomical apparatus which I term Geo-chorions, or Season Illustrators, which were both invented by me several years ago. They illustrate, in a very pleasing and novel manner, the rotation of the earth on its axis. The motion of fig. 1 is accomplished through the agency of magnetism; and that of fig. 2, by a circular kind of friction motion, on an inclined surface of glass. The instruments are of very simple construction, and will be readily understood from the following description.

"Fig. 1.—G represents a circular base, which supports a mahogany pillar, A, the top of which is bevelled off at such an angle, as to allow the ball of the earth to perform its circuit round the sun in an oblique path of 23½ degrees with the ecliptic: a bent wire is made fast in the top of the pillar, on which is placed loosely a large gilded ball, S, representing the sun. The bent wire just mentioned is at right angles to the oblique plane of the pillar; on this, as a centre, the horizontal bar, B, has its motion. On the extreme end of this bar a perpendicular pillar of brass, C, is made fast, which carries a horizontal slip or stage of brass, L, having a circular perforation large enough to admit a box, M, containing a strong bar magnet, the lower end of which protrudes at K, on which is suspended, by a steel axis, a small terrestrial globe of very light material, such as card, pith, or cork, with a map of the world delineated on it. The globe which I use is made of extremely thin india-rubber; in the centre of it is a circle of wood, to which is made fast the steel axis of the earth. The circle or disc of wood is firmly cemented to the *interior equator* of the rubber ball. After this is done, the substance is blown into a globular form, and then a map of the countries of the world laid down on it. Such a ball is scarcely of any weight, and consequently well adapted for this apparatus. When the ball E is finished, allow its steel north polar axis to come into contact with the point of the bar magnet inclosed in the box, M, and the magnet will support its weight. Take hold of the south pole at O, and give the ball E a twirl in the proper direction and it will rotate for some time, and all the while keep itself suspended to the magnet. Were the ball E spun on its axis with a cord, and then lifted up to the magnet, it would continue to move round on its axis for several minutes, and display a very pleasing effect. During the rotation of the ball, take hold of the handle, H, and give motion to the horizontal bar, B, and thereby cause the earth to circulate round the sun, S. By the obliquity of the top of the pillar, P, the earth, E, through the medium of the bar, B, will move in a corresponding oblique path round the sun. In the engraving, the vertical solar ray, P, of the sun, S, is directly over the tropic of Capricorn, and consequently our winter; remove the earth 90 degrees from this position, and the vertical solar ray will point over the equator. When at a point diametrically opposite, the solar ray will be over the circle I, or the tropic of Cancer, &c. In the bar, B, a wire, F, is fixed, and ascends a little way into a perforation in the sun; this causes the ball, S, to follow the motion of the bar, and thereby the solar ray, P, is always kept pointing to the surface of the earth, E, thus shewing where the sun is vertical at different positions of the earth in its orbit. The apparatus, therefore, shews the diurnal rotation of the earth on its axis (as if suspended on nothing); its annual and oblique motion round its orbit; and, consequently, the cause of the different lengths of days and nights throughout the year, and the beautiful vicissitudes of the seasons.

"An observation of the following phenomenon first suggested the idea of causing a light ball to rotate on its axis. Provide an ivory, bone, or wood 'tee-totum;' drill a hole in the top of the handle, to the depth of about a quarter of an inch into which insert firmly a steel pin, with a tapering point; this done, make the tee-totum to spin on its axis, and whilst it is in motion, apply the end of a bar magnet to the steel pin you inserted in the drilled hole, and you will find that the magnet, if strong, will lift up the tee-totum, which, notwithstanding, will continue in motion for a considerable time. When the tee-totum is made light, and caused to spin after the manner of the French hamming-tops, the tee-totum will rotate for a long time, suspended in space by the magnet.

Fig. 1.



"Fig. 2.—As far back as the year 1823, I used to observe the rotation of a watch-glass on the surface of a looking-glass, &c. A few years ago, whilst engaged in completing the apparatus just described, I applied a globe of india-rubber to the watch-glass, by which means the ball was charged with motion. A few remarks will make evident the operation of this second apparatus. Let L L represent a looking-glass; describe a kind of an elliptical path on the surface of the glass as a a a, and delineate a sun in the centre, or what is better (if you wish to have a glass entirely for the par-

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